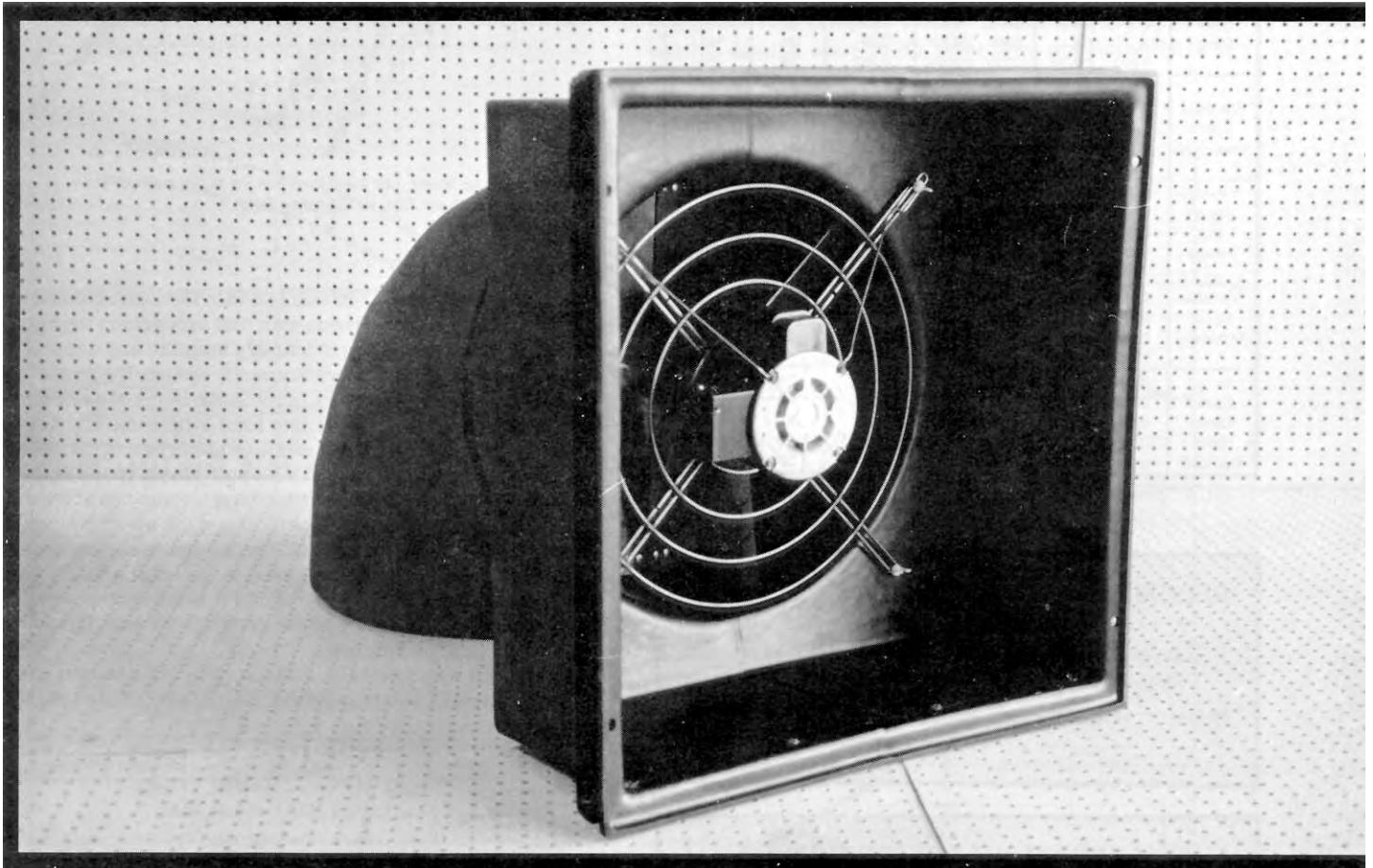


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Group 5 (i)

Evaluation Report

607



Del-Air Model J-20 Ventilation Fan

A Co-operative Program Between



**DEL-AIR MODEL J-20
VENTILATION FAN**

MANUFACTURER AND DISTRIBUTOR:

Del-Air Systems Ltd.
P.O. Box 2500
1704 Fourth Avenue
Humboldt, Saskatchewan
S0K 2A0
Ph: (306) 682-5011

RETAIL PRICE: \$555.00
(June 1989, f.o.b., Lethbridge, Alberta)

SUMMARY OF RESULTS

TABLE 1. Del-Air Model J-20 Fan Performance at Typical Levels of Operation.

SETTING	STATIC PRESSURE		AIR FLOW RATE		INPUT POWER kW	TOTAL EFF. %	FAN SPEED rpm
	in wg	(Pa)	cfm	(L/s)			
Single Speed Direct	0.000	(0.0)	3730	(1760)	0.285	28	1546
	0.050	(12.5)	3560	(1680)	0.286	31	1543
	0.100	(24.9)	3400	(1610)	0.290	34	1542
	0.125	(31.1)	3320	(1570)	0.291	35	1541
Variable Speed Maximum	0.000	(0.0)	3750	(1770)	0.295	27	1558
	0.050	(12.5)	3600	(1700)	0.298	30	1551
	0.100	(24.9)	3420	(1610)	0.296	33	1551
	0.125	(31.1)	3310	(1560)	0.296	34	1548
Variable Speed Mid Range	0.000	(0.0)	3240	(1530)	0.252	20	1345
	0.050	(12.5)	3060	(1440)	0.254	24	1331
	0.100	(24.9)	2810	(1330)	0.255	26	1331
	0.125	(31.1)	2680	(1270)	0.255	26	1334
Variable Speed Minimum	0.000	(0.0)	2140	(1010)	0.182	8	879
	0.050	(12.5)	1740	(822)	0.181	10	876
	0.100	(24.9)	1370	(650)	0.176	12	911
	0.125	(31.1)	847	(400)	0.176	8	890
Single Speed With Dampers	0.000	(0.0)	3680	(1740)	0.295	26	1559
	0.050	(12.5)	3480	(1640)	0.294	28	1560
	0.100	(24.9)	3280	(1550)	0.293	31	1553
	0.125	(31.1)	3180	(1500)	0.292	32	1548
0.250	(62.3)	2520	(1190)	0.281	35	1555	

aluminum hub are mounted directly on a 0.25 hp (190 kW), single phase, 115/230 V electric motor. The motor mount is integral with the wire inlet guard grill and is bolted to the motor and the fan housing.

FIGURE 1 shows the location of major components, while detailed specifications are given in APPENDIX 1.

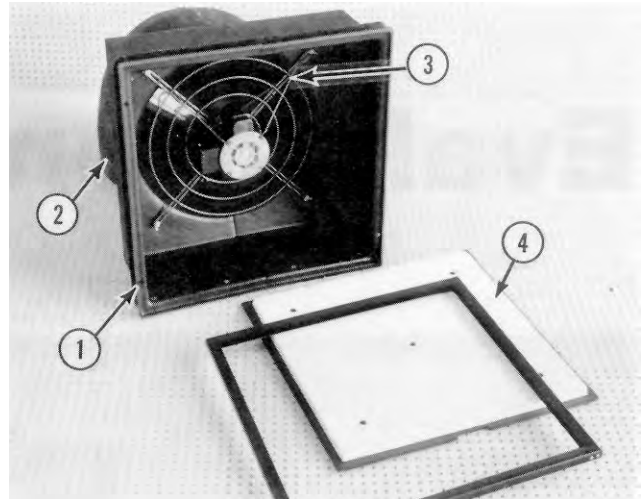


FIGURE 1. Del-Air Model J-20 Ventilation Fan: (1) Mounting Face Plate, (2) Outlet Damper, (3) Inlet Guard Grill, (4) Insulating Door.

SCOPE OF TEST

The Del-Air Model J-20 was tested in the inlet chamber set-up (FIGURE 2) in accordance with test procedures developed by the Prairie Agricultural Machinery Institute and adopted by the Alberta Farm Machinery Research Centre. The intent was to determine the performance of the fan in terms of air flow rate, static pressure, input power and total efficiency. The control unit was not evaluated and was used only to set fan speed.

The fan was tested at 230 V for both single speed and variable speed modes. Fan performance was determined at the maximum setting, the mid-range setting and the minimum setting with the variable speed control. The minimum setting was established by reducing the fan speed to the point where a static pressure of 0.125 in wg (31.1 Pa) could still be obtained.

The effect of dampers on fan performance was determined in the single speed setting.

The fan was also evaluated for ease of operation, maintenance, operator safety and suitability of the operator's manual.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Supplying fan performance data over a complete range of static pressures.

Manager: R. P. Atkins

Project Engineer: Robert Maze

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. The manufacturer is considering the revision of all printed material containing fan performance data to include performance of the Del-Air J series fans at varying static pressures.

GENERAL DESCRIPTION

The Del-Air Model J-20 ventilation fan is a 19.9 in (505 mm) diameter, variable speed, direct drive, propeller type axial flow fan. It is primarily used in livestock and poultry barns as an exhaust fan located in the wall.

The Del-Air J-20 ventilation fan is a flush-mounted unit equipped with an inlet guard grill, optional inlet louvres, a mounting face plate, integral fan shroud, outlet dampers and an insulating door. The 3-blade polypropylene propeller and

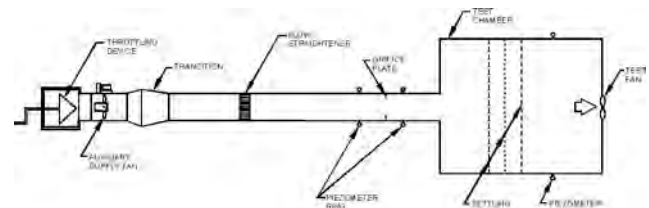


FIGURE 2. Schematic of Fan Test Apparatus - Inlet Chamber Set-Up.

RESULTS AND DISCUSSION

FAN PERFORMANCE

All fan performance results in this report are given at standard air¹ conditions so that direct comparisons can be made with other fan test reports. Fan performance under actual operating conditions could differ from these results by up to 10%, depending on such things as temperature, barometric pressure, humidity and elevation above sea level.

¹Standard air is air with a density of 0.075 lbm/ft³ (1.2 kg/m³) which occurs at 68°F (20°C), 50% relative humidity and a barometric pressure of 29.92 in Hg (101.325 kPa).

Air Flow Rate: Fan output in both the single speed mode and at the maximum setting on the variable speed control were similar (FIGURE 3). Reducing the fan speed greatly reduced the air flow rate for a given static pressure². For example, at a static pressure of 0.125 in wg (31.1 Pa), reducing the speed from maximum to mid-range to minimum setting reduced the air flow rate from 3310 cfm (1560 L/s) to 2680 cfm (1270 L/s) to 1380 cfm (650 L/s) respectively. At higher static pressures the reductions were even larger.

Air flow rates at typical levels of operation (i.e. static pressure) are given in TABLE 1. Ventilation fans are often rated on their output at a static pressure of 0.125 in wg (31.1 Pa). Alberta Farm Machinery Research Centre's measured flow rate in the single speed mode was 3320 cfm (1570 L/s). There was no manufacturer's performance information provided. Since building ventilation design is possible over a range of static pressures, it is recommended that, for fan selection purposes, the manufacturer consider supplying a table or curve of air flow rates over a complete range of static pressures.

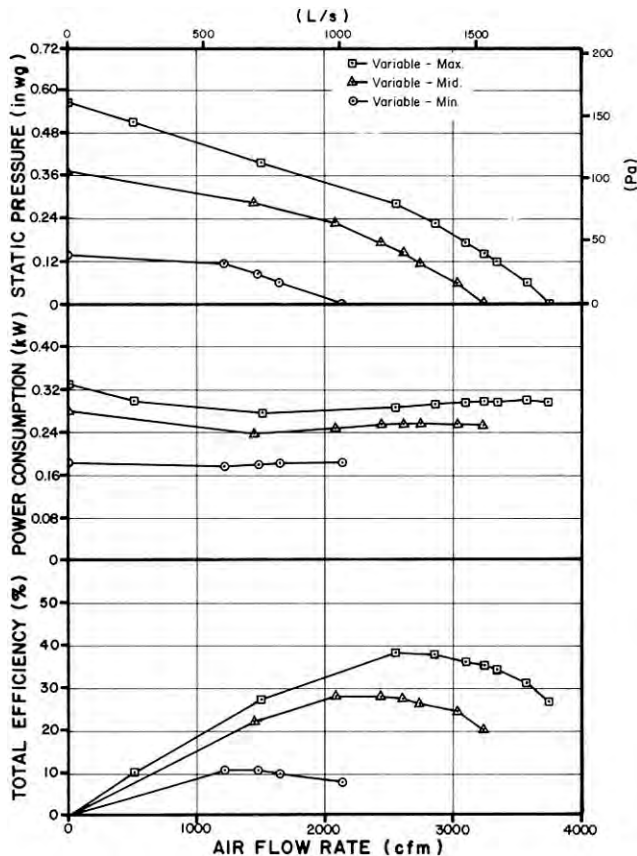


FIGURE 3. Del-Air Model J-20 Fan Performance Curves.

Power Consumption: The power consumption numbers given in TABLE 1 can be used to calculate the cost of operating the fan. To calculate the cost of fan operation, multiply the power consumption (kW) by the number of hours of fan operation times the cost per kilowatt hour.

The power consumed by the fan depended on fan speed. For typical levels of static pressure (TABLE 1), the input power varied from 0.285 to 0.291 kW in the single speed mode, from 0.288 to 0.298 kW at maximum speed, from 0.242 to 0.255 kW at mid-range and from 0.176 to 0.182 kW at minimum speed. The maximum amperage drawn by the motor was 1.5 amps, which was the same as the rated motor amperage of 1.35 amps plus the 10% allowable limit established by CSA Standards.

²Static pressure is a measure of the pressure difference between the pressure inside the building and the pressure on the outside of the building. Static pressure is usually expressed in inches of water gauge (in wg) or Pascals (Pa).

Prolonged operation in excess of rated amperage could reduce motor life.

Total Efficiency: Total efficiency is the ratio of air horsepower over the input power. Air horsepower is dependent upon the air flow rate and corresponding total pressure. For typical levels of operation, the total efficiency (TABLE 1), using the variable speed control, ranged from 27 to 39% at maximum speed, 20 to 26% at mid-range and 8 to 12% at minimum speed. The total efficiency at maximum fan speed and a static pressure of 0.125 in wg (31.1 Pa) was 34%.

Effect of Dampers: The optional dampers were installed on the outlet side of the fan to determine their effect on fan output. The fan was tested under these conditions in the single speed mode only. Using the dampers reduced the air flow rate by 1 to 8% (FIGURE 4) over the typical range of operation. For example, at a static pressure of 0.125 in wg (31.1 Pa), the dampers reduced the air flow rate by 4% from 3317 cfm (1565 L/s) to 3180 cfm (1501 L/s) (TABLE 1). The efficiency was in turn reduced from 35 to 32%. The use of other control devices such as shutters, screens and hoods would also reduce air flow rates by varying amounts. The use of such control devices have to be taken into consideration when designing a ventilation system.

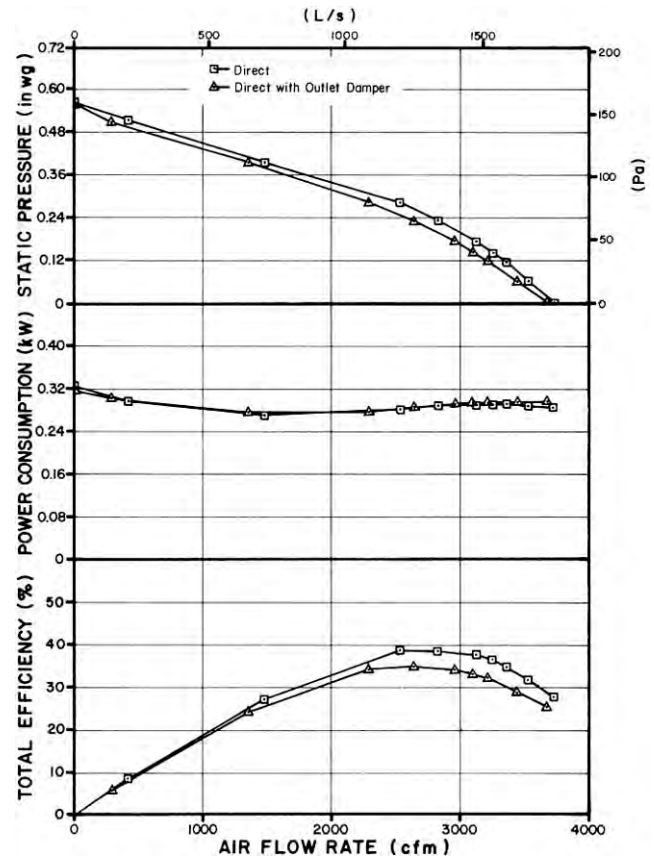


FIGURE 4. Effect of Dampers on Fan Performance.

EASE OF OPERATION

Maintenance: The operator's manual advised a routine cleaning program to remove dust and dirt build-up and a yearly check of the free movement of the fan if it had been idle for long periods. The inlet louvres were easily removed, which made for easy access to clean the fan blades and housing.

OPERATOR SAFETY

The inlet guard grill provided adequate protection from the fan blades. The motor was a totally enclosed unit and presented no safety hazards. The Del-Air Model J-20 was CSA approved.

The noise level of the Del-Air Model J-20 at a distance of 4.9 ft (1.5 m) from the centre of the fan inlet, while operating at a 0.125 in wg (31.1 Pa) static pressure, was 63 dB(A). Higher

noise levels could be expected if the fan was operated in the vicinity of other buildings. The Del-Air Model J-20 falls within range 3 of the Alberta Farm Machinery Research Centre's noise level range classification (APPENDIX II). The noise level produced by this fan can be considered annoying and be detrimental to hearing and operator performance under continuous exposure. Ear protection should be considered if working near the fan for prolonged periods.

OPERATOR'S MANUAL

The operator's manual provided detailed information on installation, maintenance and troubleshooting.

APPENDIX II		
NOISE LEVELS RANGES		
RANGE	SOUND LEVEL (dBA)	COMMENTS
1	up to 45	Tolerable, low level background noise.
2	45 to 60	Dominating background noise that would interfere with normal conversation.
3	60 to 85	Could be annoying and be detrimental to hearing and operator performance under long-term, continuous exposure. Ear protection should be considered.
4	over 85	Could damage hearing, depending on level and exposure time. Ear protection is definitely recommended.

APPENDIX I	
SPECIFICATIONS	
MAKE:	Del-Air
MODEL:	J-20
SERIAL NUMBER:	PAMI-5
MANUFACTURER:	Del-Air Systems Ltd. P.O. Box 2500 1704 Fourth Avenue Humboldt, Saskatchewan S0K 2A0
OVERALL DIMENSIONS:	
- housing width	26.0 in (660 mm)
- housing depth (motor included)	37.0 in (940 mm)
- housing height	26.0 in (660 mm)
- discharge opening	20.3 in (516 mm)
- guard grill diameter	18.8 in (478 mm)
- grill opening	0.19 in (5 mm) dia. wire spaced at 2.0 in (51 mm)
IMPELLERS:	
- diameter	19.9 in (505 mm)
- hub diameter	3.75 in (95 mm)
- number of blades	3
- blade angle	Hub 34°, Tip 19°
WEIGHT:	42.3 lb (19.2 kg)
MOTOR NAMEPLATE DATA:	
make	FASCO
model	7124-0776
class	B
type	V24B1
rpm	1650
ambient temperature rise	40°C
volts	115/230
amps	2.7/1.35
phase	1
cycles	60
horsepower	0.25 hp (186 W)

SUMMARY CHART DEL-AIR MODEL J-20 VENTILATION FAN

RETAIL PRICE:	\$555.00 (June 1989, f.o.b. Lethbridge)
FAN DESCRIPTION:	19.9 in (505 mm) propeller fan, variable speed, direct drive, 0.25 hp (186 W), 115/230 V electric motor.
FAN PERFORMANCE:	
Air Flow Rate:	
- range	847 to 3750 (400 to 1770 L/s)
- at 0.125 in wg (31.1 Pa)	3320 cfm (1570 L/s) without dampers 3180 cfm (1500 L/s) with dampers
Power Consumption:	0.176 to 0.298 kW
Efficiency Range:	
- without dampers	28 to 38%
- with dampers	26 to 35%
Efficiency at 0.125 in wg (31.1 Pa):	
- without dampers	35%
- with dampers	32%
OPERATOR SAFETY:	Inlet guard provided CSA approved noise level = 63 dB(A) at 4.9 ft (1.5 m) from fan inlet
OPERATOR'S MANUAL:	Good, provided information on installation, maintenance and troubleshooting.



ALBERTA FARM MACHINERY RESEARCH CENTRE

3000 College Drive South
Lethbridge, Alberta, Canada T1K 1L6
Telephone: (403) 329-1212
FAX: (403) 329-5562
<http://www.agric.gov.ab.ca/navigation/engineering/afmrc/index.html>

Prairie Agricultural Machinery Institute
Head Office: P.O. Box 1900, Humboldt, Saskatchewan, Canada S0K 2A0
Telephone: (306) 682-2555

Test Stations:	P.O. Box 1150
P.O. Box 1060	Humboldt, Saskatchewan, Canada S0K 2A0
Portage la Prairie, Manitoba, Canada R1N 3C5	Telephone: (306) 682-5033
Telephone: (204) 239-5445	Fax: (306) 682-5080
Fax: (204) 239-7124	